2025 Feb 10

$$v_c = [1, 0, 0 \ \cdots \ ]^T \qquad v_h = [0, 0, 0, 1, 0, \ldots]^T$$

$$v_t = [0, 1, 0, \ldots \ ]^T \qquad v_s = [0, 0, 0, 0, 1, 0, \ldots]^T$$

$$v_o = [0, 0, 1, 0 \cdots]^T \qquad v_c^T v_t = 0, \ \frac{1}{1+e^0} = \frac{1}{2}$$

$$\mathcal{L} = \sum_{t \in \{-1, 1\}} -\ln \sigma(v_c^T v_{c+t}) + \frac{1}{N} \sum_{w \in V} -\ln(1 - \sigma(v_i^T v_c))$$

$$\frac{d \ln \sigma}{d v_c} = (1 - \sigma) v_{c+t}$$

$$\frac{d\, l(1-\sigma)}{d v_c} = -\sigma v_i$$

$$\frac{d\mathcal{L}}{d v_c} = -(1-\sigma) v_h - (1-\sigma) v_s + \frac{1}{N} \sum_{i=1}^{N} \sigma(v_c^T v_i) v_i$$

$$= -(1-\sigma) \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} - (1-\sigma) \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} + \frac{1}{N} \sigma \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

hot　　smells　　average

$$= -\frac{1}{2} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} - \frac{1}{2} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} + \frac{1}{2N} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$